

Application Serial No. 10/649,577

Attorney Docket No. 0140153

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By the present amendment and response, claims 1 and 28 have been amended. Accordingly, claims 1-8, 16, 17, and 20-28 remain in the present application. Reconsideration and allowance of pending claims 1-8, 16, 17, and 20-28 in view of the following remarks are requested.

A. Rejection of Claims 1-6, 16, 20-26, and 28 under 35 USC §102(b)

The Examiner has rejected claims 1-6, 16, 20-26, and 28 under 35 USC §102(b) as being anticipated by U.S. patent number 4,530,152 to Roche et al. (hereinafter "Roche"). For the reasons discussed below, Applicants respectfully submit that amended independent claims 1 and 28 are patentably distinguishable over Roche.

Amended independent claim 1 recites, among other things, attaching a removable material to a surface of a conductive material, where the removable material comprises a soluble adhesive, and removing the removable material from conductive features formed with the conductive material and from an encapsulant. As disclosed in the present application, in one embodiment removable tape 310 is attached to metal frame 300 to prevent the adhesion of encapsulant to bottom surface 320 of frame 300. As further disclosed in the present application, tape 300 can comprise a polyimide material and a water soluble adhesive, for example.

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As stated in the present application, frame 300 is patterned and etched to form connector 120 and base 130, device 150 is electrically coupled to base 130, and device 150 and connector 120 are electrically coupled by wire 140. As also stated in the present application, after the structure has been encapsulated with molding compound, tape 310 can be removed by immersing it (i.e. tape 310) in hot water. Any residual adhesive may be removed by using a solvent such as deionized water, for example. Thus, by using an adhesive material that is water soluble, an embodiment of the invention provides a removable material for protecting a bottom surface of a frame from encapsulating material, where the removable material can be inexpensively and easily removed. Thus, an embodiment of the invention advantageously provides an improved package that is relatively inexpensive to manufacture, and can support devices having relatively high input/output counts.

In contrast, Roche does not teach, disclose, or suggest attaching a removable material to a surface of a conductive material, where the removable material comprises a soluble adhesive, and removing the removable material from conductive features formed with the conductive material and from an encapsulant. Roche specifically discloses depositing thin conductive layer 6 of low melting point alloy on metal substrate 7, forming metal connection areas 3 and 4 on alloy layer 6, positioning chip 1 on connection area 4, connecting chip 1 to connection areas 4 by wires 2, and encapsulating chip 1,

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wires 2, and connection areas 3 and 4 with hardenable resin 5. *See, e.g.,* column 2, lines 60-68, column 3, lines 1-61 and Figures 1, 2, and 3 of Roche.

In Roche, alloy layer 6 is melted by heating it to a relatively low temperature in order to remove temporary metal substrate 7. *See, e.g.,* Roche, column 3, lines 62-64. However, Roche fails to teach, disclose, or suggest attaching a removable material comprising a soluble adhesive to a surface of a conductive material, as specified in amended independent claim 1. Additionally, Roche states melting of the alloy layer also leaves a film of tin-lead alloy on the exposed surfaces of the connection areas, so that the tinning operation normally required prior to soldering on the external connections is not required in this instance. *See, e.g.,* Roche, column 4, lines 9-13. Thus, Roche teaches away from attaching a removable material comprising a soluble adhesive to a conductive material, since a soluble adhesive does not provide the advantage of eliminating a tinning operation that is achieved in Roche by melting a tin-lead alloy film.

For the foregoing reasons, Applicants respectfully submit that amended independent claim 1 is not suggested, disclosed, or taught by Roche. As such, amended independent claim 1 is patentably distinguishable over Roche. Thus, claims 2-6, 16, and 20-26 depending from amended independent claim 1 are also patentably distinguishable over Roche for at least the reasons presented above and also for additional limitations contained in each dependent claim.

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Amended independent claim 28 includes similar limitations as amended independent claim 1 discussed above. Thus, for similar reasons as discussed above, amended independent claim 28 is also patentably distinguishable over Roche.

B. Rejection of Claims 1-6, 16, 20-26, and 27 under 35 USC §102(e)

The Examiner has rejected claims 1-6, 16, 20-26, and 27 under 35 USC §102(e) as being anticipated by U.S. patent number 6,001,671 to Joseph Fjelstad (hereinafter "Fjelstad"). For the reasons discussed below, Applicants respectfully submit that amended independent claim 1 is patentably distinguishable over Fjelstad.

In contrast to amended independent claim 1, Fjelstad does not teach, disclose, or suggest attaching a removable material to a surface of a conductive material, where the removable material comprises a soluble adhesive, and removing the removable material from conductive features formed with the conductive material and from an encapsulant. Fjelstad specifically discloses patterning conductive pads 110' and conductive region 115' in conductive layer 101' on dielectric polymer sheet 100', bonding semiconductor chip 120' to conductive region 115', electrically connecting semiconductor chip 120' to conductive pads 110' by wirebonding wires 130', and encapsulating conductive pads 110', conductive region 115', semiconductor chip 120', and wirebonding wires 130'. *See, e.g., column 5, lines 27-46 and Figures 2A-2D of Fjelstad.*

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In Fjelstad, portions of dielectric polymer sheet 100' are then removed by chemical etching or laser ablation operations so as to expose pads 110' and conductive region 115'. *See, e.g.,* Fjelstad, column 5, lines 46-49. However, Fjelstad fails to teach, disclose, or suggest attaching a removable material comprising a soluble adhesive to a surface of a conductive material, as specified in amended independent claim 1. As such, dielectric polymer sheet 100' is not a soluble adhesive that can be removed by hot water, as disclosed in the present application. Furthermore, Fjelstad fails to teach, disclose, or suggest any particular method of attaching conductive layer 101' to dielectric polymer sheet 100'.

For the foregoing reasons, Applicants respectfully submit that amended independent claim 1 is not suggested, disclosed, or taught by Fjelstad. As such, amended independent claim 1 is patentably distinguishable over Fjelstad. Thus, claims 2-6, 16, and 20-27 depending from amended independent claim 1 are also patentably distinguishable over Fjelstad for at least the reasons presented above and also for additional limitations contained in each dependent claim.

C. Rejection of Claims 7-8 and 17 under 35 USC §103(a)

The Examiner has rejected claims 7-8 and 17 under 35 USC §103(a) as being unpatentable over Fjelstad, as applied to claims 1-6, 16, 20-27, taken with U.S. patent number 6,111,199 to Wyland et al. (hereinafter "Wyland") and Weng et al. (hereinafter

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“Weng”). As discussed above, Fjelstad fails to teach, disclose, or suggest attaching a removable material to a surface of a conductive material, where the removable material comprises a soluble adhesive, and removing the removable material from conductive features formed with the conductive material and from an encapsulant.

Wyland specifically discloses ring 322, which is mounted on substrate 324 underneath each lead 321I to prevent the leads from deforming due to pressure applied by a wire bonding machine. *See, e.g.,* column 7, lines 33-36 and Figure 3B of Wyland. In Wyland, the adhesive included in ring 322 is dissolvable in water or by crumbling into a powder when heated to a high temperature. *See, e.g.,* Wyland, column 7, lines 65-67 and column 8, line 1. However, Applicants submit that the structure and use of ring 322 is substantially different than dielectric polymer sheet 100' in Fjelstad. In particular, the sacrificial layer in Fjelstad is utilized to protect bottom surfaces of conductive pads and a conductive region, while ring 322 is mounted under leads to prevent the leads from deforming due to pressure applied by a wire bonding machine. As such, Applicants respectfully submit that there is insufficient motivation to combine Wyland and Fjelstad as suggest by the Examiner. Furthermore, in Fjelstad, the sacrificial layer comprises a dielectric polymer sheet (e.g. dielectric polymer sheet 100') having a conductive layer (e.g. conductive layer 101') on one surface. *See, e.g.,* Fjelstad, column 5, lines 27-29. Thus, ring 322 in Wyland and the sacrificial layer in Fjelstad are substantially different in formation and purpose.

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Weng specifically discloses removing an adhesive residue from a polymeric based tape from the surface of a wafer by using deionized water. *See, e.g.,* Weng, column 5, lines 34-36. However, Weng discloses a debris-free wafer marking method, which is completely unrelated to the method of manufacturing a semiconductor package disclosed in Fjelstad. As such, Applicants respectfully submit that there is insufficient motivation to combine Fjelstad and Weng as suggested by the Examiner. Thus, Applicants submit that the purported teachings suggested by the Examiner are not based on anything that can be gleaned from the teachings of these references considered together. Rather, the teachings suggested by the Examiner (i.e. the combination of Fjelstad, Wyland, and Weng) are based on classic hindsight reconstruction given the benefit of Applicants' disclosure, which is impermissible.

Thus, for the foregoing reasons, Applicants respectfully submit that claims 7-8 and 17 depending from amended independent claim 1 are patentably distinguishable over Fjelstad, Wyland, and Weng, either singly or in any combination thereof.

D. Rejection of Claim 28 under 35 USC §103(a)

The Examiner has rejected claim 28 under 35 USC §103(a) as being unpatentable over Fjelstad taken with Roche. As discussed above, Fjelstad and Roche each fail to teach, disclose, or suggest attaching a removable material to a surface of a conductive material, where the removable material comprises a soluble adhesive, as specified in

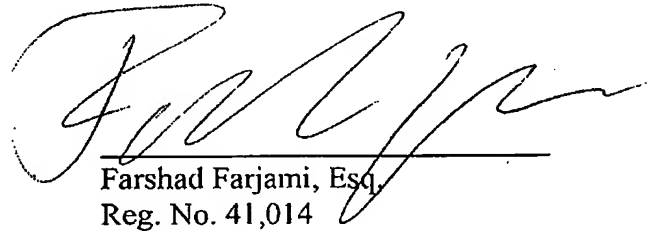
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amended independent claim 28. Thus, for similar reasons as discussed above, Applicants respectively submit that amended independent claim 28 is patentably distinguishable over Fjelstad and Roche, either singly or in combination thereof.

E. Conclusion

Based on the foregoing reasons, amended independent claims 1 and 28, and claims depending therefrom, are patentably distinguishable over the art cited by the Examiner. For all the foregoing reasons, an early Notice of Allowance for pending claims 1-8, 16, 17, and 20-28 is respectfully requested.

Respectfully Submitted,
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